Claims

1. A method for time-scale modification of an audio signal by which an input signal comprised of an input stream of audio samples is converted into an output signal modified at a desired time-scale, comprising the steps of:

determining an analysis window consisting of a first predetermined number of audio samples in said input stream;

repeating a computation of a similarity between Nov first audio samples of said analysis window and Nov second audio samples of said output signal whenever said analysis window is shifted within a predetermined search range, said similarity being calculated using third and fourth audio sample blocks consisting of audio samples down-selected from said first and second audio samples at a predetermined rate, respectively; and

obtaining a shift value Km of said analysis window when a maximum value of the calculated similarity is provided.

2. A method for time-scale modification of an audio signal as claimed in claim 1, further comprising the step of determining N+Nm-Nov audio samples as an add frame based upon the shift value Km and an optimal overlap length Nm at the time that a coefficient of correlation between said analysis window and said output signal is above a predetermined threshold value or provides a maximum value, said N being a value that a similarity search range Kmax between said analysis window and said output signal is deducted from said first predetermined number.

3. A method for time-scale modification of an audio signal as claimed in claim 2, further comprising the steps of: forming an overlap-add block by weighting Nm audio samples from the beginning of said add frame and Nm

audio samples from the end of said output signal with a weighting function; and substituting said overlap-add block for said Nm audio samples from the end of said output signal and adding the rest audio samples of said add frame to the end of said overlap-add block as they are.

4. A method for time-scale modification of an audio signal as claimed in claim 1, wherein said audio samples consisting of said third and fourth audio sample blocks have a difference in sample index as much as M_1 which is a natural number bigger than 2.

5. A method for time-scale modification of an audio signal as claimed in claim 1, wherein said first predetermined number is N+Kmax, whereN and Kmax are constants, said search range is a range of Kmax audio samples and said analysis window is regularly shifted by M_2audio samples per one time shift, where M_2 is a natural number bigger than 2.

6. A method for time-scale modification of an audio signal as claimed in claim 1, wherein said audio samples consisting of said third and fourth audio sample blocks have a difference in a sample index as much as M_1 which is a natural number bigger than 2, said first predetermined number being N+Kmax, where N and Kmax are constants), said search range being a range of Kmax audio samples, and said analysis window being regularly shifted by M_2 audio samples per one time shift, where M_2 is a natural number bigger than 2.

7. A method for time-scale modification of an audio signal as claimed in any one of claims 4 to 6, wherein said M_1 being a sample index interval (that is, selection interval) of the audio samples consisting of said third and fourth audio sample blocks and/or said M_2 being a shift interval of said analysis

window have a value of one of two integers closest to a value obtained by dividing an actual sampling rate of said input signal by a reference sampling rate of a predetermined size.

8. A method for time-scale modification of an audio signal as claimed in any one of claims 4 to 6, further comprising the step of preparing corresponding values each of which is mapped into each one of various sampling rates of audio signals in advance and applying a corresponding value mapped at a sampling rate figured out from header information of said input signal as an assigned value of said M_1 being a sample index interval (that is, selection interval) of the audio samples consisting of said third and fourth audio sample blocks and/or said M_2 being a shift interval of said analysis window.

9. A method for time-scale modification of an audio signal as claimed in claim 1, further comprising the step of receiving a value α designated by a user through an input means as said desired time-scale, wherein a length ratio of said output signal to said input signal identical to said value α.

10. A method for time-scale modification of an audio signal as claimed in claim 7, wherein a first audio sample of a m^{th} analysis window is an mSa^{th} audio sample from the beginning of said input stream, and said value Nov being reduced at a predetermined rate by setting N-Ss as a maximum value thereof, where said Ss is a fixed value, and said Sa is determined by a relation of Ss= α Sa.

11. A method for time-scale modification of an audio signal as claimed in claim 1, wherein said similarity is determined by computing a cross-correlation.

12. A method for time-scale modification of an audio signal by which an input signal comprised of an input stream of audio samples is converted into an output signal modified at a desired time-scale, comprising the steps of:

determining an analysis window consisting of N+Kmax audio samples in said input stream, where said N and said Kmax are constants;

while shifting said analysis window within a predetermined search range, computing a maximum value of a similarity between Nov audio samples of said analysis window and Nov audio samples from the end of said output signal and values of coefficient of correlation therebetween with changing said value Nov into various values;

determining N+Nm-Nov audio samples from a Km+Nov-Nm^{th} audio sample from the beginning of said analysis window as an add frame, where said Km is a shift value of said analysis window when said maximum value of said similarity is provided, said Nm being an optimal overlap length when a coefficient of correlation between said analysis window and said output signal is above a predetermined threshold value or provides a maximum value, and said N being a value obtained when N+Kmax is deducted by a similarity search range Kmax between said analysis window and said output signal;

forming an overlap-add block by weighting Nm audio samples of said optimal overlap length from the beginning of said add frame and Nm audio samples of said optimal overlap length from the end of said output signal with a weighting function; and

substituting said overlap-add block for said Nm audio samples of said optimal overlap length from the end of said output signal and simply adding the rest audio samples of said add frame to the end of said overlap-add block.

13. A method for time-scale modification of an audio signal as claimed in

claim 12, further comprising the step of receiving a value α designated by a user through an input means as said desired time-scale, wherein a length ratio of said output signal to said input signal identical to said value α.

14. A method for time-scale modification of an audio signal as claimed in claim 12, wherein the first audio sample of a m^{th} analysis window is an mSa^{th} audio sample from the beginning of said input stream, and said value Nov being reduced at a predetermined rate by setting N-Ss as a maximum value thereof, where said Ss is a fixed value, and said Sa is determined by a relation of Ss= α Sa.

15. A method for time-scale modification of an audio signal as claimed in claim 12, wherein said threshold value with respect to said coefficient of correlation is over 0.7.

16. A method for time-scale modification of an audio signal as claimed in claim 12, wherein audio samples participated in computing said similarity and said coefficient of correlation are selected among signals belonging to the respective Nov audio samples of said analysis window and said output signal and adjacent audio samples of said participated audio samples have a difference in sample index as much as M_1 which is a natural number bigger than 2.

17. A method for time-scale modification of an audio signal as claimed in claim 12, wherein said shifting of said analysis window is performed in a manner that said analysis window is regularly shifted by M_2 audio samples per one time shift, where M_2 is a natural number bigger than 2 and the number of

shifted audio samples in total is not larger than Kmax audio samples of a search range.

18. A method for time-scale modification of an audio signal as claimed in claim 12, wherein audio samples participated in computing said similarity and said coefficient of correlation are selected among signals belonging to the respective Nov audio samples of said analysis window and said output signal, adjacent audio samples of said participated audio samples having a difference in sample index as much as M_1 which is a natural number bigger than 2, said shifting of said analysis window being performed in a manner that said analysis window is regularly shifted by M_2 audio samples per one time shift, where M_2 is a natural number bigger than 2, and the number of shifted audio samples in total being not larger than Kmax audio samples of a search range.

19. A method for time-scale modification of an audio signal as claimed in claim 12, wherein said parameter M_1 and/or said parameter M_2 have a value of one of two integers closest to a value obtained by dividing an actual sampling rate of said input signal by a reference sampling rate of a predetermined size.

20. A method for time-scale modification of an audio signal as claimed in claim 12, wherein said similarity between Nov audio samples of said analysis window and Nov audio samples of said output signal is determined by using a cross-correlation or said coefficient of correlation.